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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Plant Pest Control Division
Washington 25, D. C.

SOYBEAN CYST NEMATODE SURVEY

The soybean cyst nematode (Heterodera glycines Ichinohe) was first discovered in the United States in New Hanover County, North Carolina, in 1954. It has since been found in Pender County, North Carolina; Lake, Dyer and Obion Counties, Tennessee; Pemiscot County, Missouri; and Mississippi County, Arkansas. It is a serious pest of soybeans capable of reducing yields and under conditions of continuous soybean culture will render a field unfit for soybean production.

The soybean cyst nematode can reproduce only in the presence of host plants. These include soybeans, snap beans, lespedeza and vetch. Even though hosts are not grown, some of the cysts may remain viable in the ground for many years. Tremendous populations of cysts are produced where susceptible hosts are grown in the same field year after year.

Surveys to locate new infestations of the soybean cyst nematode must be carefully planned. Its habits, host requirements and the visible symptoms it causes must be used to design a survey plan that will eliminate wasted effort. Specific assignments should be given to field crews and records kept of the work accomplished by each unit.

The following plan has been developed as a basis for a survey of this pest. It is divided into five phases:

- | | | |
|-------|-----|---------------------------------------|
| Phase | I | Education and Planning |
| Phase | II | Acquisition of Equipment and Training |
| Phase | III | Soil Sampling |
| Phase | IV | Field symptom and Soil Sampling |
| Phase | V | Delimiting |

Phase I (Education and Planning)

It is obvious from the very first that it will be impossible and probably unnecessary to sample each field in the soybean-producing areas. To get maximum coverage, however, a program should be developed in cooperation with state regulatory officials, Entomology and Pathology Departments, County Agents, Extension Service specialists, research groups and others which will provide the following information:

1. The location of the oldest soybean production areas.
2. The location of fields that have been in soybean or other suitable host production continuously.
3. Leads from growers reporting symptoms or declining yields.
4. Fields that have gone out of soybean production because of unexplained crop failure.

The results of this phase should point to areas of highest priority for gathering soil samples before and during the next growing season. It may also point up some fields that should be sampled immediately.

Phase II (Acquisition of Equipment and Training)

Before going into the field to gather samples it will be necessary to:

1. Acquire Equipment
 - a. Sacks (#12 wet strength - double thickness)
 - b. Sampling trowels - 24" overall
 - c. Shoe brushes
 - d. Binding tape or stapling machine
 - e. Waterproof marking crayon or marking ink
 - f. Hand lens
2. Train Field Crews
 - a. To take samples
 - b. To mark samples properly
 - c. To prepare forms properly

To establish washing facilities it will be necessary to:

1. Acquire Equipment
 - a. Soil sample washing machine with necessary sieves
 - b. Binocular microscopes
 - c. Laboratory equipment (plastic is preferable to glass)
- (1) Beakers

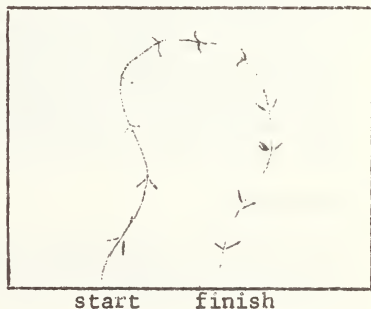
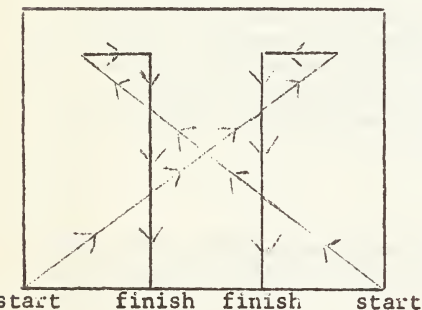
2. Provide location not adjoining agricultural land having:
 - a. Running water - 40 pounds of pressure (minimum)
 - b. Electricity
 - c. Disposal facilities
3. Train personnel
 - a. To operate machine
 - b. To use binocular microscope
 - c. To maintain sanitation
 - d. To handle samples properly
 - e. To recognize cysts in floatson

Phase III (Soil Sampling)

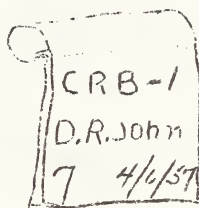
It may be necessary to sample some of the areas or fields meeting the requirements outlined in Phase I prior to the growing season. If so, care should be taken to avoid muddy fields because cysts from wet samples are difficult to recover with the flotation washing process. Generally, if a field can be worked with farm machinery, it is satisfactory for sampling.

A field crew of two or three men seems to be most satisfactory. The size of the field will determine the number of samples and the pattern to be used. A diagonal or circular pattern is satisfactory for this survey.

Diagram



The above is satisfactory when land is fallow but after crops are up, a 25 x 25 pace grid pattern should be used. A leader should be designated who will make the owner contacts, pick up the composite samples and keep the records. As the surveyors move through the field, small subsamples (about a tablespoonful) are taken with the trowel from the top two inches of soil every 25 paces. These are placed in a properly labeled sack until 4-6 pounds of soil are collected. The bag should be labeled before samples are taken and in such a manner that all information is visible after the bag has been sealed. The inspector's collection number, which consists of his initials and a serial number is recorded on the first line on the side of the bag. (see sketch) The first collection made on the survey is No. 1. Each collection thereafter, regardless of the State or County, is numbered in a series. Thus an inspector's first collection would be numbered "CRB-1", (inspector C. R. Blank # 1), the second collection as "CRB-2", etc.



The name of the farmer, grading house, map designation, or field number is placed on the second line. The date (month, day, year) is recorded in the lower right-hand corner of the bag. The samples obtained in each field are numbered consecutively beginning with No. 1. On the last sample in a series, following sample number, the notation End is made. Each field is recorded as a separate collection.

The number of fields to be examined within a designated area prior to the growing season will depend upon the information developed by your educational program. If specific fields are found with a history of symptoms or declining yield, each of these should be sampled. In areas meeting the general qualifications listed above, fields selected at random from each square mile should be sampled.

Sanitation

When the surveyors have completed sampling a field, they must brush their shoes and clean their trouser cuffs before moving to the next field.

A vehicle must not be driven into a field to load samples. It should be left on the highway or a well-traveled access road and the samples carried to it.

Care should be taken to prevent spillage of samples in transit or in the laboratory. Treat every sample and every field as though they contained viable cysts.

Phase IV (Field Symptom and Soil Sampling)

As the season progresses and the soybeans are about half grown, observations should be made for symptoms throughout the soybean area. Particular attention should be given to those areas designated in Phase I. The following action should be taken when symptoms are found in a field:

1. Record the location of the field.
2. Map the spot or spots within a field.
3. Examine the roots of 5-10 plants, depending on area involved with hand lens for cysts.
4. If cysts are found they should be placed, together with the roots, in vials containing formalin and referred to the laboratory for determination.
5. Take a soil sample from affected area (approximately a quart including root fragments).
6. Exercise sanitary measures outlined in Phase III

This phase of the general survey is considered to be the most important since it offers several additional factors to increase the accuracy of the survey. Visible signs will be present from some cause to pinpoint sampling. Soil conditions will be optimum for the washing process, etc. It also comes at a time when large number of observers can be enlisted to help as they conduct their routine activities.

An attempt should be made to keep this phase systematized. If possible, assignments should be made in advance. If this proves impractical, insist that field notes be kept and areas where observations have been made be recorded. These records should be sent to a central point where progress maps and current status reports can be maintained.

Phase V (Delimiting)

The routine described above is designed to point to general areas that may be infested. Once an area is found to be infested special surveys will be devised to delimit and map the areas accurately.

Handling Specimens for Determination

Until facilities are available for making determinations in the field, all specimens will be submitted according to instructions outlined by Mr. Kelvin Dorward, Plant Pest Survey Section, in PPC Branch Memorandum No. 803.1.

The cysts should be placed in a 5% solution of formalin made from diluting a commercial grade 40% solution one part to seven parts water. A small card bearing the identification symbol, using a soft pencil, should be placed in each vial. The cork or screw-top cap should be taped to prevent its working loose in shipment. Each sample should be accompanied by a properly executed PPC 3-9 (4 copies to accompany each sample) and sent to:

U. S. Department of Agriculture
Agricultural Research Service
Plant Pest Control Division
P. O. Box 5152
Memphis 12, Tennessee

Field Forms and Their Routing

Until revised forms are available form GN-2 will be used for field survey. To avoid any possible confusion in the future, the word "Golden" should be marked out and "Soybean" written in its place. It is important that this form be filled out in its entirety, in duplicate and that the information requested be stated clearly. In the left-hand column, first line, the date of the survey is recorded. If there is a map designation to the property, it is placed on line 2. Line 3 bears the crew leader's collection number. Line 4 and 5 denote the number of acres in the property and the number of soil samples collected. The estimated number of acres should also be shown on form PPC 3-9 which accompany any specimens submitted. On line 6 the survey pattern is recorded - such as 25 x 25, 8 x 8, or 2 x 2 pace method or random. On line 7, a check is put in the box applicable to the type of survey. On line 8, a check is put in the box applicable to the kind of survey.

On the right-hand column, the location of the stored samples is recorded on line 1. On line 2, the operator of the field

surveyed is recorded. The operator's mail address is recorded on line 3 and a brief description of the location of the property is given on lines 4 and 5. The location of the field surveyed as to state and county is given, followed by the names of the crew leader and men who assisted him in the survey. No further data is recorded by field survey personnel on the front of this form.

On the reverse side of form GN-2, a simple diagram of the property inspected is drawn. On this diagram is noted the location of each soil sample collected and the dimensions of the block from which the sample is taken. Enough landmarks should be shown, together with names of roads, telephone pole number, etc., so that the field may be relocated without difficulty. On the lower portion of the form the inspector indicates the type of crop on the field at the time it is inspected and other information, such as change of development of the crop, etc. In the lower right-hand corner the leader indicates north on the compass symbol. Instructions on the routing of GN-2 forms will be issued after the central laboratory is placed in operation.

A sufficient number of Golden Nematode Handbooks is on hand to supply each person who has charge of a survey unit.

April 23, 1957



